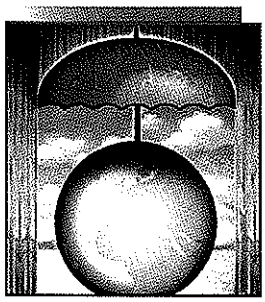

The Terror Part of Terrorism

The Role of Human Infrastructure in Terrorism Risks and Responding

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In this follow-up article to "Terrorism Risks and Responding in Rural and Frontier America," which appeared in the 2002 special bioterrorism edition of *IEEE Engineering in Medicine and Biology Magazine*, we discuss the biological, psychological, and social aspects of humans responding to terrorism—what we call the terror part of terrorism. We specifically take the approach of viewing humans and their systems as *human infrastructure*; that is, the people and relationships that make up the communities in which we live and work. We aim to inform readers of the development and content of the field of traumatic stress and show how this information can be used to build responses to our current questions regarding responding to terrorism. The article is organized into six parts: (a) an introduction to terrorism and disaster responding; (b) a review of the development of the field called traumatic stress; (c) a review of the potential range of human biological, psychological, and social (e.g., biopsychosocial) reactions to extreme events such as terrorism; (d) an examination of the health economic aspects of terrorism; (e) illustrations of response frameworks that use evidence-based and promising practices; and (f) suggestions and recommendations for responding to the *terror part of terrorism.*

As a result of the global spate of early 21st-century terrorist incidents, people around the world—from all types of organizations—are asking the question: How do we know what helps people and their communities regain their equilibrium when they are disrupted by a terrorist act? How do we conceptualize and respond to the terror part of terrorism?

In the 2002 special bioterrorism edition of this magazine, one of the authors addressed the human infrastructure [1] associated with terrorism risks and human response in the rural and frontier United States [2]. This article expands the 2002 article, addressing human infrastructure from the larger perspective, focusing on event temporality (pre-, peri-, and post-event) as it combines with aspects of the people who experience the event and the human systems in which they occur. By human infrastructure, we mean the people and relationships that make up the communities, larger and smaller, in which we live and work. Human infrastructure refers to the health and strength of the people, their belief systems, and the goods and services they produce and consume. It is related to human capital and, in the most fundamental way, to human existence. As will be shown in this article, the accumulation of scientific and professional literature in the interdisciplinary traumatic stress field provides a strong scientific and clinical base from which to learn the best ways to protect and rebuild our human infrastructure in response to terrorism.

Terrorism and Disasters

As human beings, we share the trait of being able to experience extreme fear [3]. A variety of events can bring about this level of distress, some of which occur naturally and others that are caused by human action. One such event, terrorism, results from human action. Warfare, in the form we currently recognize as terrorism, was less common in pre-20th-century history than directly killing one's enemy with swords, cudgels, or guns [4]. In recent times, there has been a shift from conventional weapons for war and terrorism to a type of weapon of mass destruction (WMD) that includes chemical, biological, radiological, nuclear, and high yield explosives (CBRNE) weapons [5], [6]. These types of weapons, in addition to their obvious effects, may be particularly capable of causing widespread fear, confusion, and stress that may alter the long-term health of affected communities and the larger community's sense of well-being [7].

Terrorist events violently interfere with our daily patterns and often leave individuals, families, and even entire populations in distress and confusion. Terrorists, warlords, and other *ministers of chaos* [8] count on their ability to instill fear and confusion as methods of bringing political power to bear on an enemy; demoralize populations; and create chaotic, fluid situations that are easily exploited. In response to such events, governments and their military, public safety workers, and humanitarian aide workers are usually asked to reestablish order from the chaos in the post-event period.

Unfortunately, responding to terrorism and disasters is a growth industry at international, federal, and local levels. In fact, between 1991 and 1999 the number of nongovernmental organizations (NGOs) throughout the world almost doubled, from 23,600 in 1991 to 44,000 in 1999, and the growth continues to expand [9]. Multiple governmental and NGO agencies provide response. The United Nations Disaster Assessment and Coordination office (www.reliefweb.int/undac), the American Red Cross (www.redcross.org), and the International Committee of the Red Cross and Red Crescent (www.icrc.org) respond to active disasters, wars, and acts of terrorism. In the

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United States, the U.S. Federal Emergency Management Agency (FEMA, www.fema.gov) is perhaps the best known responder. Established by a congressional act in 1803, FEMA is now housed in the Department of Homeland Security [10]. In addition, each U.S. state maintains an office of disaster management that is coordinated with that state's unit of the National Guard. Even this long list of agencies is just a fraction of the organizations that respond to disasters and terrorism worldwide (see in the U.S. alone, www.firstgov.gov/Government/State_Local/Disasters.shtml).

Despite the worldwide rise in the numbers of terrorism and disaster response agencies, it is unlikely that those who experience terrorism and psychological warfare will ever view the world the same as they did prior to a terrorist event. Most people will not develop a long-term pathology such as posttraumatic stress disorder (PTSD) [11], but many will experience greater or lesser amounts of disruption in their lives and, often, changes in their belief systems. Physical infrastructures can be rebuilt and people can regain a sense of normalcy that is at once protective and restorative. Research has shown, however, that this recovery is uneven at best, and that there is a relationship between individual and community pre- and post-event function, as well with the quality of people's ability to contribute to recovery efforts. Thus, it is important to national and international security to tend not only to the physical mechanics of terrorism but to the terror part of terrorism, which affects the human infrastructure and the people from which the infrastructure arises. However, mounting a response is not, in and of itself, sufficient. We must respond well if we are to address the terror part of terrorism.

Background on Traumatic Stress as a Field

The Development of the Scientific Literature on Traumatic Stress

While many in the world—particularly the government and people of the United States—have become acutely aware of terrorism following the events of September 11, 2001, the extant literature on traumatic stress and terrorism pre-dates that event by centuries. Stories about the effects of war, disasters, and catastrophes—as well as victoriously overcoming or falling prey to their ill effects—are as old as recorded history and can also be discerned in the oral histories of most cultures. However, even the output of scholarly literature of the more recent past is rich and varied. For example, the National Center for Posttraumatic Stress Disorder (www.ncptsd.org) maintains a database of the current worldwide literature on PTSD and other mental-health consequences of exposure to traumatic events. As of fall 2003, there were over 22,000 publications catalogued. Electronic databases of literature cannot contain the totality of information on terrorism and trauma but they can help gauge trends and indicate the direction of emerging literature in specific fields. A review of *Medline*, *Old Medline*, *PsychInfo*, and *Pilots* suggests that the scientific literature began to emerge coherently following World War I, followed by a second expansion around World War II, and a third during the Vietnam War era. Based on a search of the psychological literature (*PsychInfo* and *Pilots*), from 1900–1979 and post-1980, the volume of literature expanded rapidly after 1980 (see Figure 1) [12]. It should be noted that the medical literature in general has proliferated over the same period of time [13], yet

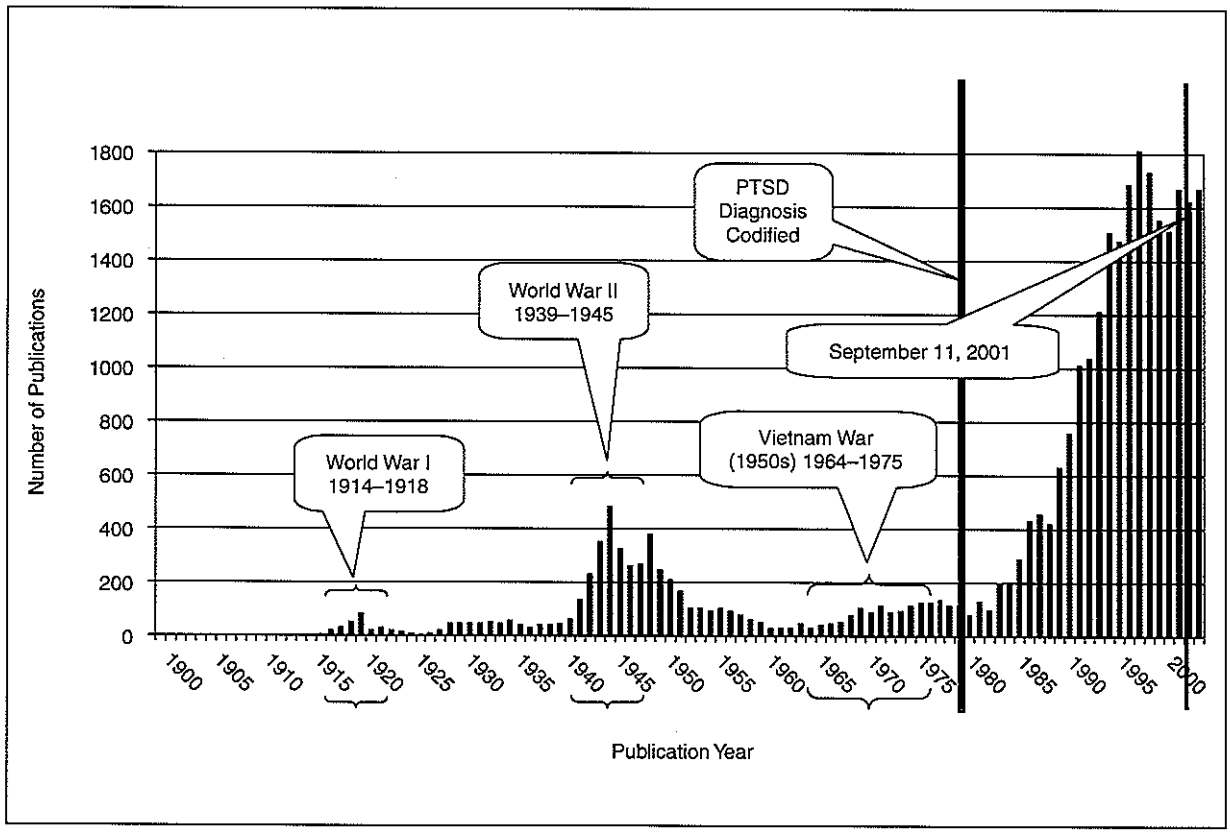

Fig. 1. Number of traumatic stress papers in key databases by year, 1900–2002.

the overall expansion of publications alone is not explanatory [14]. In fact, the ratio of scientists to publications (1:10) has remained constant for the past 30 years [15].

In the United States, the key taxonomy of mental disorders is the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Diseases* (DSM), which currently corresponds closely to the International Disease Code (ICD-10) [16]. The first version was published in 1952 as the health care profession was wrestling with the after-effects of World War II and the Korean War. In this manual, the sequelae of intolerable stress was labeled "gross stress reaction" [17], but usually was associated with the immediate, not delayed, effects. The revision of the original DSM was released in 1968 during the Vietnam War [18]. Gross stress reaction was recategorized as a transient adjustment disorder, similar to other adult life crises such as unwanted pregnancy [19]. In retrospect, this change has been interpreted as reflecting the tumultuous political tenor of the time [20]. Due to the widespread efforts of clinicians, politicians, and organizations, post-war and catastrophic-event distress was recognized legally and clinically, and in 1980 the posttraumatic stress disorder diagnosis was first included in the official medical nomenclature [21].

Key Organizations for the Study of Traumatic Stress

In 1983, Charles R. Figley urged his colleagues to form a society to study traumatic stress, which subsequently was organized in 1985, and in 1990 became the International Society for Traumatic Stress Studies (www.istss.org). In 2003, it remains the premiere scholarly organization dedicated to the study of exposure to extreme stress, disseminating information through organizational support and its scientific publication, the *Journal of Traumatic Stress*. The National Center for Posttraumatic Stress Disorder (NC-PTSD) was established by the U.S. Congress in 1989 within the Veterans' Administration (now the Department of Veterans Affairs, VA). The congressional mandate required the NC-PTSD to coordinate and promote PTSD research and training across the VA, federal agencies, and nonfederal organizations [22]. In 1991, the National Institute of Mental Health of the National Institutes of Health (NIMH) established the Violence and Traumatic Stress Research Branch, recognizing that the membership of ISTSS was one of the main constituencies of the new program [23]. By 2003, the NIMH intramural research program and all three extramural divisions were conducting and supporting research relevant to traumatic stress. This research spans and integrates basic behavioral and neurosciences, clinical practice, and health care system factors. The National Child Traumatic Stress Network (NCTSN) was established in 2001 to improve access to care, treatment, and services for children and adolescents and their families exposed to traumatic events. The NCTSN is funded through a competitive grant program administered by the Center for Mental Health Services (CMHS), Substance Abuse Mental Health Services Administration (SAMSHA) at the U.S. Department of Health and Human Services. The review for the first round of grants established an initial cohort of 17 treatment development and community services centers across the United States and a coordinating center co-located in California and North Carolina. Over the past two years, the NCTSN has grown to 54 centers located in 32 states and the District of Columbia. In 2002, the coordinating center established a Terrorism and Disaster Branch dedicated to promoting the well-being of children and families by strengthening the nation's preparedness and response to terrorism and disaster [24]. Nations around the world, including Argentina, Australia, Canada, France, Norway, South Africa, The Netherlands, and Kuwait have federal and/or NGO national centers and societies for the study of traumatic stress [25].

On the Meaning of Traumatic Stress

As with any emerging field of study, there are risks in the political machinations of identifying and codifying human response to extreme stress. Some have argued that the "medicalization" of responding to extreme stress is either a fabrication [26], culturally insensitive to the point of being wrong, or a misinterpretation of civil unrest and other potentially dangerous violence [27]. From the perspective of community development and public health, the consequences of violent disruption of life, as is typical with terrorism and armed conflict, have pervasive and insidious effects that are not well articulated from a medical perspective [28], [29].

Most scientists and practitioners would agree that it is inappropriate to impose the construct of a mental illness *en masse*. What we name as pathology in the Western world may be a common response to massive life disruptions elsewhere; it may be so common that it is essentially the normal way of life for some communities that are in constant upheaval and may even be protective. Herein lies a potential problem. Acting from good intentions, people from outside of a community may rush to offer aid and assistance following horrifying events. However, indiscriminately introducing "techniques" accepted in one environment into a different environment raises potential problems. For example, "train the trainer" models are popular in developing nations yet are at risk for poor quality of information transfer past the first or second level of trainings. Critical Incident Stress Debriefing (CISD), one of many popular post-event interventions, is commonly used with emergency services personnel and is believed by many to be helpful. Yet the research indicates that this particular technique is often unevenly applied and in most cases it is neutral or not necessary for everyone. At its worst, CISD may increase symptoms [30], [31]. These negative findings, however, do not suggest that we cease to try to respond. Most people would be uncomfortable without any post-event response, and ignoring the event may be more troublesome in the long run than using a technique that is marginally helpful. So how does one plan and respond to terrorism and disaster events? The key appears to be in shaping the response to the type and magnitude of the event and carefully matching the intervention with the characteristics of the community.

Human Biopsychosocial Reactions to Extreme Events

In order to best match our response to the event and the people we seek to help, it is necessary to understand the consequences of exposure to extreme stress. This section briefly summarizes the literature on human and community responses.

The popular belief is that there is a direct causal link between distress and exposure to catastrophic events. The empirical evidence shows a far more complex relationship. The relationship is at least partly bidirectional. Individual characteristics can increase the risk of exposure to extremely stressful events and that exposure may precipitate episodes of post-event distress such as PTSD and depression. The impact of catastrophic events depends upon their

severity and predictability, as well as the direct and indirect impact of the event. The victim's pre-event mental functioning, individual personality, group social supports, etc., influence the event, the individual interpretation of the significance of the event, and post-event sequelae [32]. Unlike individual traumatic events, disasters tend to strike people without preference to any personal characteristics that increase their risk of exposure to other kinds of traumatic events and/or adverse mental health outcomes.

Human health and behavior, including problems linked to mass trauma situations, generally have multiple determinants, each with its specific contribution to the outcome. These determinants include a variety of genetic endowments, vulnerabilities, biological and psychosocial environmental risks, and protective and moderating factors. These factors operate over time to induce certain states of health or patterns of interpersonal and social attitudes and behaviors. General and mental health states are themselves determined by genetic assets and vulnerabilities: environmental influences in the course of pre-natal and postnatal development (including nutrition, health, and disease status of mother during pregnancy); exposure to environmental toxins, bacteria, viruses, and other hazards; influences of the home, school, and neighborhood environments; measures taken by parents and caregivers towards prevention (e.g., vaccinations and supervision and guidance by parents, teachers, and other significant adults); peer group influences; and exposure to other physically, psychologically, or socially harmful events. Moreover, the expression of certain genotypic characteristics is influenced by environmental/experiential factors. Psychobiological maturity and robustness tend to minimize the impact of both unfavorable and favorable life events [33].

Human Response to Extreme Stress

It is important to define "extreme stress." Extreme stress is not simply a great deal of what we understand as "normal" stress. Extreme stress usually contains some element of life threat or threat to the physical integrity of a person. Traumatic stress elicits specific neurotransmitters and hormones [34] as well as changes in function during stimulation of trauma-specific memories in the hippocampus, medial prefrontal cortex, and cingulate gyrus [35]. Extreme stress may alter the physiological function of a person in the short term or even permanently [36], [37].

Human beings can react to extreme stress in many ways. Interestingly, there is a remarkable homogeneity in the initial response; heterogeneity develops over time [38]. Individual responses may range from feeling stronger for having experienced the event to grave psychological and biological decomposition. In fact, some people—particularly those who are vulnerable before the event or feel overwhelmed by the event—may be troubled by indirect exposure to the event or its aftermath [39]. At the community level, changes may disrupt the very systems that support the well-being of humanity or the recovery from exposure to extreme events [40], [41].

While not the only outcome of exposure to traumatic stressors, PTSD is the cardinal medical disorder associated with a pathological reaction to extreme stress [42]. There are several characteristics that have to present in order for this diagnosis to be relevant. First, the person has to have been exposed directly or indirectly to a life-threatening event (Criterion A1), and react with "intense fear, helplessness, or horror" (Criterion A2). There are three symptom clusters: intrusive thoughts and images of the event (Criterion B), avoidance of the event or reminders of the event (Criterion C), and physiological arousal associated with event-related biochemical changes (Criterion D). For example, people with PTSD may report feeling guilty for surviving the event or about things they did or did not do in relation to the event. They may avoid situations or activities that remind them of the event. These avoidance behaviors may interfere with their relationships with others—particularly family members—or even lead to the loss of a job. People with PTSD may be at increased risk for other mental illnesses, including panic disorder, obsessive-compulsive disorder, phobias, depression, somatization disorder, and substance-related disorders. Laboratory findings may show increased arousal demonstrated through the autonomic nervous system [43].

Other pathological responses range from depression to nonspecific gynecological or gastrointestinal diseases. There are associations with gastrointestinal and cardiovascular disorders, vasospastic phenomena, myocardial ischemia, coronary artery disease, respiratory disorders, musculoskeletal disorders, and skin disorders [44]. In one ten-year study, people with anxiety disorders typical of traumatic stress reactions were at significantly higher risk for developing medical diseases such as cerebrovascular disease and arthrosclerosis. Other risks included ischemic heart, gastrointestinal, hypertensive, and respiratory diseases [45].

"Invisible" catastrophes have unique characteristics in that they may equally shape the lives of those who are exposed and those who believe they may have been exposed [46]. In events such as releases of chemical or radiological agents, it may be impossible to know immediately who was and who was not exposed. Nonetheless, the reactions associated with the fear of being exposed have proved to be highly salient in producing psychological casualties, such as PTSD or other anxiety or depressive disorders. In mass casualty events, people may present the health care system with multiple occurrences of unexplained somatic symptoms. While it is easy to want to dismiss these "worried well" as noncasualties, especially when others are more obviously "wounded," research has shown that even the fear of exposure can have long-term negative psychological and biological consequences [47].

Long-term stressors that involve elements of captivity (e.g., family violence, torture, prisoner of war, etc.) may elicit in its victims shame, despair, hopelessness, loss of previously sustained beliefs, hostility, social withdrawal, feelings of being permanently damaged, feelings of being constantly threatened, and changes from previous personality characteristics [48]. These psychological consequences are often described as *Complex PTSD*. This term is not officially in the U.S. medical nomenclature, but a similar one is listed in the international disease code (ICD 10), known as "Enduring Personality Change after Catastrophic Event." This type of reaction is associated with prolonged exposure to a hideous event, such as torture. The disorder is marked by permanent hostility and distrust, social withdrawal, emptiness and hopelessness, dependency, aggression modulation, hypervigilance and irritability, and alienation [49].

A Significant Review of the Disaster Literature: What Do 60,000 Voices Say?

In a review of the disaster literature, Norris and colleagues examined scientific papers on 102 separate events comprising 160 separate samples accounting for over 60,000 individuals [50]. The papers included a variety of designs, time frames,

and research methods. Adults in the United States were overrepresented, but the studies included children, adolescents, college students, and older adults from 29 countries across five continents. Studied events included floods, hurricanes, earthquakes, wildfires, nuclear and industrial accidents, transportation accidents (e.g., ground, air, and sea), sniper attacks, and bombings that caused massive destruction and death. Participants reported experiences ranging from inconvenience to life-threatening danger, severe injuries, multiple bereavements, and the total destruction of their communities.

Six sets of negative outcomes were observed in these papers, including: 1) specific psychological problems, 2) nonspecific distress, 3) health problems, 4) problems in living, 5) resource loss, and 6) problems in youths. Psychological outcomes were the most common, including anxiety, depression, and—most notably—PTSD. Problems in living and psychosocial resource loss created ongoing difficulties. Children and youth manifested age-typical symptoms like behavioral problems, hyperactivity, and delinquency and were also vulnerable to PTSD, depression, somatic complaints, and ongoing stress.

Because it was impossible to compare precisely across the samples, an estimate of severity was created by ranking outcomes using a four-point scale from minimal/transient (1) to severe (4). Most studies (51%) demonstrated moderate impairment, indicative of prolonged stress. Twenty-one percent (21%) showed severe impairment, and 18% showed very severe impairment, indicative of clinically significant distress (determined on the basis of percentages scoring above established cut-points on standardized scales) or criterion-level psychological disorder (determined on the basis of diagnostic instruments). Only 11% showed minimal or highly transient impairment. It should be noted that these are not epidemiological results based on population estimates, but specific studies that were initiated because something horrifying had happened to a particular group of people. Among these people, the effects of the disasters may be quite enduring. The duration of the event is related to the magnitude of the event; stronger effects were more common with longer events. In general, the symptoms and effects were greatest during the first year, with most people improving over time. However, for a significant minority of participants, many studies demonstrated symptoms that lingered for months or years.

Short-Term Predictors and Long-Term Outcomes

One of the most significant terrorist events in the United States prior to September 11th was the April 1995 bombing of the Murrah Federal Building in Oklahoma City. One hundred sixty-seven people were killed, including 19 children. Nearly 600 people suffered injuries. Over 100 children lost a parent, and many more lost other family members. Smith, North, and Pfefferbaum [51] began a study within six months of the bombing that involved clinical interviews with 182 survivors. Their research provides some guidance about short-term predictors of long-term mental health outcome and functioning and an understanding of the recovery process and patterns of symptom resolution and continuance. Of the interviewees, 87% had physical injuries, 77% needed medical treatment, 20% were hospitalized, and 15% required surgery; 87% reported seeing someone killed or seriously injured; and 50% reported believing that they were going to die.

In relation to the bombing, nearly every participant in the study experienced PTSD symptoms. PTSD was the most prevalent post-disaster disorder, with 93% of those fulfilling criteria meeting full PTSD criteria. Only 4% reported no bombing-related symptoms. Women had significantly higher rates than did men of PTSD, major depression, generalized anxiety disorder, and other post-disaster disorders. Among those who developed a disorder, PTSD was the most prevalent. Common and distressing intrusive re-experience and hyperarousal symptoms were not associated with a post-disaster illness, while avoidance/numbing symptoms were strongly associated with the disorder. The onset of PTSD was rapid. Seventy-five percent (75%) of the cases had immediate onset, and only 3% had onset more than three weeks after the event. Nearly half of the subjects with a predisaster disorder developed PTSD compared to only 25% of those with no predisaster psychopathology. Nearly two-thirds of the PTSD cases had an active co-occurring diagnosis after the event; major depression was the most prevalent at 55%. Demographic variables (female, divorced/separated, and lower levels of education) were strong predictors of post-disaster disorder. Injuries—concussions, ocular injuries, dehydration, hearing loss—were also predictors of PTSD, as was degree of reported recovery from physical injuries.

Turning to friends and relatives was nearly universal but did not distinguish those with psychiatric illness from others. More than one-third of the survivors used medications to cope; nearly 75% of those with PTSD and a comorbid disorder used medications. Over 40% of the sample consulted a professional, and psychiatrists were seen about half as often as others. Even with problems, people were resilient. Six months after the event, 28% reported full recovery, 60% reported partial recovery, and only 13% reported no recovery since the bombing. Fully 85% of the people had returned to work. In the aftermath of the event, once the most basic needs were met—such as first aid, housing, and food—the survivors actively used mental health services for supportive counseling and assistance in resuming normal activities. PTSD and PTSD comorbid with another active disorder were very strong predictors of mental health treatment.

The Economic Impact of Terror's Effect on Health

There is a growing awareness of the importance of social and economic forces in determining the health status and welfare of any population [52]. As has been noted, traumatic events can have a significant effect on health, the use of health services, and the productivity of those affected [53]–[55]. As with health in general, the recent outbreak of terrorism has increased interest in trauma's effect on human capital and a nation's level of productivity and income.

There is a large body of work on the economic valuation of health and health care and on the economic costs of specific diseases, conditions, behaviors, and events, but little rigorous work on the economic effects of health sequelae of traumatic events. Greenberg et al., however, provide compelling data [55]. In 1990, anxiety disorders cost U.S. $42.3 billion, which was approximately U.S. $56 billion in 2000. Of this $42.3 billion, only $13.3 billion (31%) was associated with psychiatric treatment. Just over half (52%) of the costs actually went to nonpsychiatric medical costs and $0.8 billion (2%) in prescription pharmaceutical costs. Fully 10% ($4.1 billion) were indirect workplace costs, nearly all of which (88%) were associated with lost productivity while at work [43]. To put anxiety disorders in context, in 2000, cancer cost the United States $257.2 billion dollars and diabetes $38.9 billion [56].

The concept of *human capital,* developed during the 1960s and early 1970s, refers to the investments in education, public health infrastructure, and health care services that are major determinants of a nation's economic activity and the health status of the population that is a determinant of a nation's growth potential [57], [58]. These variables correlate directly with both personal and national income. The concept of human capital has been applied to traumatic stress [43], [59], [60]. The incidence and prevalence of traumatic stress has a direct impact on human capital when productivity cannot reach optimum levels and individuals are unable to attain their potential levels of either health status or income. One particularly interesting application uses human capital, willingness to pay, and utility loss as a way to understand torture and related political- and government-sponsored violence and trauma [49].

Economic data on the impact of PTSD is scarce, but the magnitude and its impact on economic costs can be illustrated by looking at the incidence and prevalence rates of PTSD and examining some of the cost estimates derived for other conditions, diseases, and events. The process used in estimating economic costs is outlined in the next section.

Economic Costs

Economic costs should be understood as "opportunity costs" or alternatives foregone in the consumption of scarce health resources [61]. There are costs associated with any course of action and for nonaction. Opportunity costs are fundamental to understanding the economic valuation of health outcomes, the resources required to provide effective interventions, and the consequences of failure to provide such interventions. Failure to avert preventable events or provide effective early intervention results in the consumption of resources that can then no longer be used for alternative purposes.

Accurate comprehensive estimates of the personal and societal cost resulting from terrorism must include both direct and indirect costs. The investigation of cost variables is complex as costs represent, most frequently, a flow or series of uneven recurring expenditures of resources. Therefore, measurement of costs entails inclusion of both short- and long-run direct and indirect costs. This is particularly true for the measurement of the economic costs of traumatic events that result in traumatic stress-related physical and psychological disorders where long-term effects are common and frequently entail very long-term economic burdens.

Accurate cost accounting includes a variety of direct and indirect costs. At a minimum, direct costs include: 1) medical care services—emergency and prehospital services, ambulance, emergency department, EMS services, physician services, and other personnel costs; 2) hospital inpatient costs; 3) psychological, counseling, and psychiatric services; 4) ambulatory medical care—hospital outpatient services, ambulatory clinic, office-based care, and pharmaceuticals; 5) disability and rehabilitation services—physical therapy, occupational therapy, and speech and hearing therapy; 6) long-term care—rehabilitation and custodial care; 7) home health care services—home health and personal assistance services; 8) administrative costs; 9) police, legal, and court costs; 10) welfare and human services costs; and 11) costs accruing to other victims in an event. Indirect costs include: 1) foregone production (earnings) due to death, injury, and disability; 2) consumption foregone from reduced income; 3) value of time, production, and consumption foregone by family during care of injury victims; and 4) value of reduced earnings stemming from early termination of education to care for an injured family member.

This summary uses a human capital approach to valuation [62], but does not estimate the value of intangibles such as pain and suffering, traumatic stress, and depression. These variables are approached with a "contingent-valuation" or "willingness-to-pay" methodology [63]. Many potential costs are involved in estimating the total cost of the terror part of terrorism. However, data for these categories is usually incomplete or unavailable. Even with inadequate data, they are critical in estimating the overall costs of traumatic stress and its economic impact on foregone productivity and the overall economy. Obviously, it is extremely difficult to determine accurately the proportion of these costs that can be assigned specifically to traumatic stress-related conditions such as PTSD, but its role is significant and has a large and magnifying effect upon both direct and indirect costs. Failure to understand thoroughly the economic and social implications of these conditions will inevitably result in the inefficient use of scarce health and mental health resources and further denigration of the nation's critical supply of human capital.

Minimizing the Adverse Effects of Terrorism and Disasters

Many prevention and intervention concepts have scientific support. These include public education on the psychological aspects of terrorism; educating primary care providers to identify, treat, and when appropriate, refer for specialty mental health care; and increasing support for culturally and linguistically appropriate mental health interventions, especially vulnerable populations. The key to using the tools that we have well is good planning.

There are three main phases to consider in planning. First is the pre-event phase. As indicated above, pre-event function has an impact on peri- and post-event function. In addition to plans for evacuation and other measures to mitigate effects of an attack, there is a range of issues with mental and behavioral health implications. For example, at the institutional level, what mechanisms are in place for the ongoing maintenance of key relationships such as those among the business, public safety, medical, public health, and mental health sectors? How can the application of psychological science to the construction of the messages ameliorate the fear that is the goal of terrorism? Quality communications are critical in tempering the spread of rumor, fear, and uncertainty by conveying trusted and accurate information about risk and protective measures—both in preparing a population and in gaining cooperation with public health mitigation plans. Thus, it is important to establish a protocol for all aspects of communication.

At the individual and family level, do people know what to do in the case of an emergency? An example of preparedness at the family level is the "Family Preparedness: Thinking Ahead" document prepared by the National Child Traumatic Stress Network [64]. This simple, two-page document urges families to "think ahead" and make their own individual disaster plans. These plans involve educating family members for community disaster preparedness, creating a family emergency plan that includes making a family communication plan, preparing an emergency food and medical kit, staying informed, and practicing disaster routines.

On a larger, community level, the affectively charged time of an event and the period immediately afterwards (peri-event) can

be fraught with mistakes and confusion. Thus, pre-event group planning helps prevent response-caused crises. Communications are critical for instructing people how to respond in a crisis and will instill a greater (and avoid a lesser) amount of confidence in those in charge. Key concerns include: Who is authorized to talk to the public? Who will serve as the sources of information and how should these communicators advise the public to behave? What methods can be used to communicate complex information? How well do the communications reach and translate to special groups such as the elderly, non-English-speaking households, people with disabilities, and children?

Post-event, most people will more or less return to their previous ways of functioning. However, as noted above, some people have more difficulty than others in re-establishing their biopsychosocial equilibrium. The risk factors for poor outcome include pre-event level of function as well as a host of common factors such as poverty, lack of positive social support, and poor community infrastructures. Most terrorism and disaster-response programs focus on the acquisition of goods and services, bolstering self-esteem, and feelings of control as a means for overcoming the risks associated with helplessness and distress following life-threatening events.

Developing a Response Plan

In October 2001, the National Institute of Mental Health worked with the U.S. Departments of Defense, Justice, Veteran's Affairs, other Department of Health and Human Service agencies, the American Red Cross, and disaster mental health experts from six countries to address the impact of early psychological interventions. The goal of this meeting was to identify and disseminate information about what works, what does not work, and what gaps exist in our knowledge. The final report, *Mental Health and Mass Violence: Evidence-Based Early Psychological Intervention for Victims/Survivors of Mass Violence* [65], provides guidance on the timing of responses by disaster stage, the role of mental health providers, and training of the health and human service workforce. The report notes that some interventions—including mass education via media outlets—although beneficial, have the potential for unintended harm. The report recommends that the leadership select professionals who have the training, expertise, accountability, and responsibility required to provide these interventions.

Figure 2 provides sample guidance on the timing and content of interventions.

Special Considerations for Specific Groups

Public health is population based. It requires considering the masses of people that are in one's charge, not the individuals that make up that mass. Populations have specific subgroups that usually require special consideration. For example, a good plan for children may not be a good plan for elders. A good plan for an urban area may fall short in a rural area. This section briefly notes some of these subgroups. Each planner should take into consideration the specific age, socioeconomic, and cultural characteristics of the population for whom they plan. Below are a few examples of group characteristics showing differential effects of disasters and trauma.

Developmental Characteristics: Children

There are few published studies on children and their responses to terrorism. Generalizing from other traumatic stressors, such as child abuse or war, researchers hypothesize that children may develop aggression, antisocial behavior, or posttraumatic stress reactions [66]. In the absence of parents and home, many schools face the reality of being key intervention points [67], [68]. One recommended approach is to take an ecological model where distressing events are continuous social phenomena and addressed through community-based models [69]. Children may benefit from interpretation and assistance with appropriate generalization of experiences. For example, a child may not understand statistical probability of an event or the geographic proximity of danger in the same way as an adult.

Developmental Characteristics

Older people are often more able to display resilience than their younger counterparts [70]. Even when exposed to an extreme event, they report fewer symptoms [71], [72]. The cause of this phenomenon is unknown, but several hypotheses exist. First, it may be that older adults have gained experience and wisdom as a result of greater life experience. Second, it may be that those who were most vulnerable to the negative effects of trauma have already succumbed to death, leaving behind a more resilient population. Third, it may be that the biopsychosocial makeup of older adults is less amenable to change as a result of exposure to extreme events. Finally, older adults simply may have less exposure due to lower use of public media and other group phenomena. Regardless, the fact exists that older adults demonstrate resiliency and may be good supports and role models for others. In addition to potentially providing support for recovery, special consideration is due older adults in disaster planning. For example, they may need more time and assistance in the event of an evacuation.

Culture-Related Characteristics

There are many ethnic and cultural groups that have characteristics worth special note. Language accommodations may be appropriate for non-English-speaking groups. Some specific ethnocultural subgroups, fleeing from previous trauma, exist within other cultures. For example, a neighborhood may include a group of refugees resettled by an NGO. The occurrence of a terrorist attack or disaster may be perceived as reliving their previous war-zone experiences and cause what might appear to be a disproportionate response if one is unaware of the previous trauma. Similarly, the impact of a mass trauma event may look quite different in a community plagued with endemic violence (random and targeted interpersonal violence, abuse, etc.). Communication of event planning and responding may need to be adapted to specific cultural criteria or be conveyed by a member of the culture in order to be perceived as important or trustworthy. Pre-, peri-, and post-event interventions work best when they take the local culture's characteristics and strengths into account [2], [32].

Job-Related Characteristics

Certain positions place people in dual roles that may engender specific types of stresses. For example, those who must respond to and live in the same distressing event experience it as both victims and helpers. While helpers often choose their roles from a desire to fulfill altruistic needs to assist others, they also may be vulnerable to becoming overwhelmed by their role as a helper. For example, they may be accused of performing inadequately; they may be chronically short of food, sleep, and other

Phase	Preincident	Impact (0–48 hours)	Rescue (0–1 week)	Recovery (1–4 weeks)	Return to Life (2 weeks–2 years)
Goals	Preparation, improve coping	Survival, Communication	Adjustment	Appraisal/ Planning	Reintegration
Behavior	Preparation versus denial	Fight/flight, freeze, surrender, etc.	Resilience versus exhaustion	Grief, reappraisal, intrusive memories, narrative formation	Adjustment vs. phobias, PTSD, avoidance, depression, etc.
Role of All Helpers	Prepare, train, gain knowledge	Rescue, protect	Orient, provide for needs	Respond with sensitivity	Continue assistance
Role of Mental Health Professionals	**Prepare** Train Gain knowledge Collaborate Inform and influence policy Set structures for rapid assistance	**Basic Needs** Establish safety/ security/survival Ensure food and shelter Provide orientation Facilitate communication with family, friends, and community Assess the environment for ongoing threat/ toxin **Psychological First Aid** Support and "presence" for those who are most distressed Keep families together and facilitate reunion with loved ones Provide information and education (i.e., services), foster communication Protect survivors from further harm Reduce physiological arousal	**Needs Assessment** Assess current status, how well needs are addressed, recovery environment, what additional interventions needed for 1. Group 2. Population 3. Individual **Triage** Clinical assessment Refer when indicated Identify vulnerable, high-risk individuals and groups Emergency hospitalization or outpatient treatment **Outreach and Information Dissemination** Make contact with and identify people who have not requested services (i.e., "therapy by walking around")	**Monitor the Recovery Environment** Observe and listen to those most affected Monitor the environment for toxins Monitor past and ongoing threats Monitor services that are being provided	**Treatment** Reduce or ameliorate symptoms or improve functioning via • Individual, family, and group psychotherapy • Pharmacotherapy • Short-term or long-term hospitalization

Fig. 2. Sample guidance for timing of interventions (65).

Role of Mental Health Professionals (continued)		**Monitoring the Impact Environment** Observe and listen to those most affected Monitor the environment for stressors **Technical Assistance, Consultation and Training** Improve capacity of organizations and caregivers to provide what is needed to reestablish community structure, foster family recovery/ resilience, and safeguard the community Provided to • relevent organizations • other caregivers and responders • leaders	**Outreach and Information Dissemination** Inform people about different services, coping, recovery process, etc. (i.e., by using established community structures, fliers, Web sites) **Fostering Resilience and Recovery** Social interactions Coping skills training Education about stress response, traumatic reminders, coping, normal vs. abnormal functioning, risk factors, services Group and family support Foster natural social support Look after the bereaved Repair organizational fabric Operational debriefings, when this is standing procedure in responder organizations Spiritual support		

basic life necessities; and they may worry about their own family and wonder who is looking after them. Workers who are not carefully supported may burn out, become traumatized by their work, or face problems doing their work safely and well during or after the event [73]. This effect may be amplified when workers are deployed into known dangerous situations such as war zones, disaster sites, or refugee camps [74]. The American Psychological Association's "Fostering Resilience" series notes that when clients are in crisis, they need more help. When that crisis is a shared crisis, the helpers may struggle with both personal and professional vulnerabilities [75].

Gender-Related Characteristics

In the definitive review of gender issues, Norris et al. examined the extant worldwide epidemiology studies [76]. They found that men were more frequently exposed to Criterion A1 events than women, yet women report more trauma-related symptoms. While the precise cause of this difference is unknown, women appear to be at greater risk than men for developing PTSD in the aftermath of disasters. The differentiation is visible by adolescence and peaks in middle age, dissipating in late life. Breaslau found that in the United States, the burden of PTSD is greater in women than in men, in large part due to the greater effect of assaultive violence on women [77]. Holbrook et al. similarly found women at greater risk for the development of PTSD, but that the risk was independent of the mechanism of injury [78]. During disasters, women may be expected to take on duties of nurturance—"holding the family together"—and procuring food and shelter. Women fair worse than men in disasters when disruptions are great and expectations for nurturance are high [79].

People with Disabilities

There is little to no scientific literature on the differential effect of disasters and terrorism on people with disabilities. Even so, we know that large-scale disasters and mass-casualty events that threaten physical or psychological injury to the general population are likely to affect people with disabilities even more [80]. Public evacuation plans often require individual action that is difficult or impossible for some people with disabilities. For example, evacuation from a building via the stairs may be impossible for those with a mobility disability. In the World Trade Center disaster, people with disabilities died in disproportionately higher numbers in comparison to other workers [81]. In a 2001 survey completed by Harris Interactive for the National Organization on Disability, 58% of people with disabilities said they did not know whom to contact about emergency plans for their community in the event of a terrorist attack. Nearly two-thirds (61%) had no plans as to how to quickly and safely evacuate their home. Only 50% of people with disabilities in the workplace had workplace plans for evacuation [82].

Geography, Climate, and Population Density

Different geographies and population densities determine the practicality of many plans, or the access to different resources [1]. For example, in an urban area, multiple hospitals may be capable of receiving patients, while in a rural area, the number of patients in need of admission may exceed the total number of beds available in a critical access hospital. Similarly, a cold climate requires different types of rescue equipment than does a hot climate. Storms or hazardous road conditions may dictate the ability of others to converge on a terrorism or disaster site. Densely populated and built-up areas or narrow spaces may require disaster site access via foot or bicycle rather than via a truck.

These are only samples of the special considerations that can be attached to a local area as it plans for interventions. As noted in the beginning of the article, the best responses are grounded in science, well matched to the type and magnitude of the event, and appropriate to the community in which they occur.

Conclusions and Recommendations

While we have a great deal of information about human reactions to extreme stress, more knowledge is needed about how to reduce and prevent the negative effects of exposure to extreme events, including terrorist events. One of the most important things needed now is how best to incorporate the massive influx of both interested people and funds into the existing infrastructure of the traumatic stress field. Those with many years of experience in the field marvel at the sudden interest and at the same time lament their inability to convey the vast knowledge that has been developed. The inability to disseminate such knowledge rapidly, authoritatively, and decisively means that many efforts at the international, national, and local levels duplicate previous work, or worse yet, may implement plans that have been shown previously to be inefficacious or even potentially harmful.

Thus, the central need at this time is the thoughtful dissemination of key scientific findings, evidence-based practices, and promising practices from the traumatic stress literature. It is important to remember, as noted by the Institute of Medicine, when we look to translational research and evidence-based practices we must not use rigidly applied techniques, but the best research evidence, clinical expertise, and the values of the recipients of our efforts [38], [84].

To be truly successful with an integrated response, we need to know more about real-world settings. We need to know more about the value of the contributions of the responders and clinicians and what works across different situations such as cultures, economic-development levels, age-development levels, geography, population density, and languages. Some of the pressing current needs to developing high-quality human infrastructure-related disaster responding are:

1) process and outcome studies to evaluate current mass trauma responding
2) effectiveness studies that take into account the cultural, health status, and other complexities of individuals and the human infrastructure in which they live
3) methods and tools for assessing and triaging based on risk severity
4) translational research to develop communication for the public and health care providers about testing, evacuation, vaccination, treatment, and quarantine
5) studies to explore the efficacy of novel drug candidates and early psychosocial interventions to prevent adverse outcomes
6) research on methods to understand the effect of helping on those working in terrorism responding and how to support them in their efforts
7) integrated strategies to monitor disruption at a national and/or international level that still take into account the conditions at the local level
8) research on the long-term effects of terrorism and disasters on the community's health and its ability to support its members

9) economic research on the long-term effects of terrorism and disasters on human capital and human infrastructure at the individual and societal levels.

We need to make investments in responding to the terror part of terrorism. Investing in research, planning, and responding to the terror part of terrorism enhances our capacity to strengthen our security by improving the functioning of victims and responders alike. Those who are funded to prepare national and international public health systems for potential terrorism and natural disasters need to know to look to the traumatic stress field for information on how to prepare, inform, and guide the public and health and human service workforce as well as how to measure and manage population distress to promote a functional society. As was previously noted, those who are doing better before a traumatic event do better after the event. An investment in the health of people today is an investment in the health of people in the future; it is valuing and protecting our human capital.

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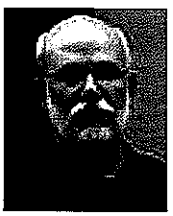

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Endnotes/References

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